

# BOUNDARY

## scan leads lead-free redesign

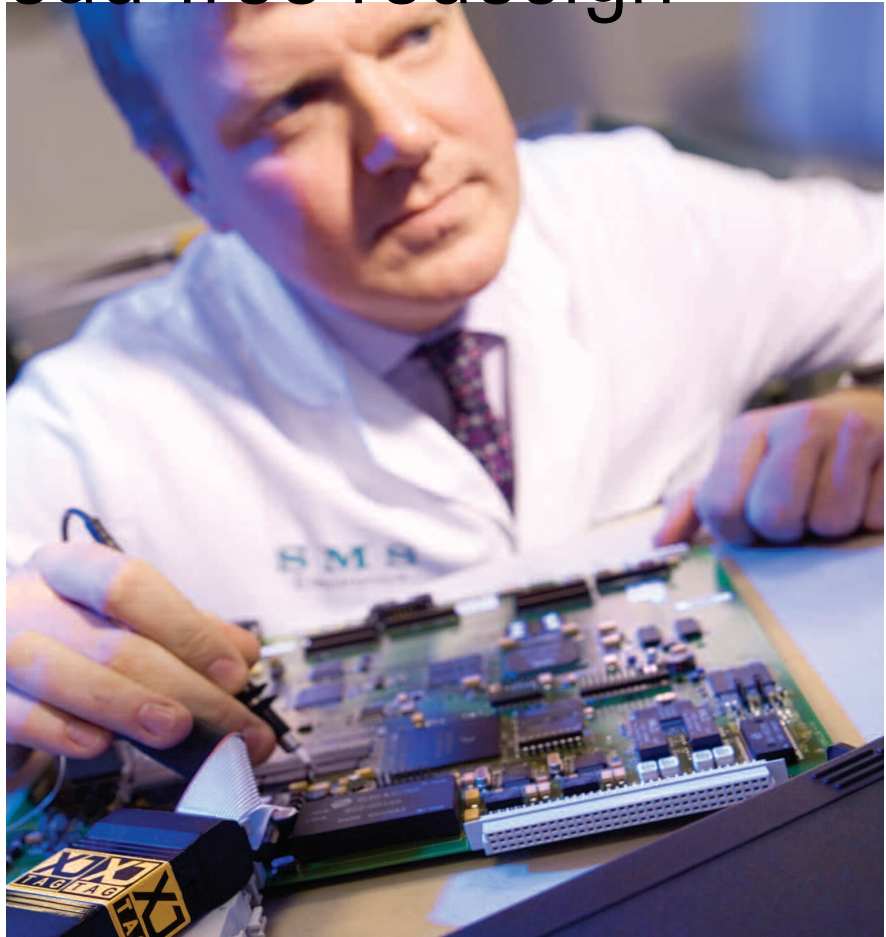
**SMS Electronics has invested in the XJTAG boundary scan development system to speed up fault diagnosis on complex boards with multiple JTAG devices such as ball grid arrays (BGAs) and limited test points - and to assist with a flurry of RoHS-led redesign work**

**S**MS Electronics in Beeston, Nottingham is one of the largest EMS companies in the UK. Its customers are vendors of advanced, complex products including telecom, medical and industrial equipment. Its services span design for manufacture and test, rapid prototyping, procurement, PCB and full product build, test and life cycle support, and the company currently supports more than 600 live products.

To offer high-quality, repeatable assembly on a fast turnaround basis, SMS Electronics maintains high-speed, flexible facilities usually only expected of multinational, tier one EMS businesses. This allows placement capacity of up to 4 million components per day, as well as the ability to perform 12 to 18 daily set-up changes.

The company philosophy emphasises comprehensive testing as an inherent part of the manufacturing process. "If we build a product, we would prefer to have the ability to test it," says Chris Hunt, sales and marketing director. "This is very important, given the nature and high-complexity of the products we build on behalf of our customers."

To explain how SMS delivers this philosophy, Hunt describes the



company's continual investment in test capabilities, backed up by a team of twelve dedicated test engineers out of a total workforce of just over 200. Extensive in-house equipment includes automatic optical inspection, 3 in-circuit test platforms, specialised backplane tester, and a flying probe tester.

For added speed and flexibility, the company has recently invested in the XJTAG boundary scan solution to support its customers with rapid prototyping; full production testing where physical probe access is challenged or impossible; and where product redesign and enhancement is inevitable.

One factor driving the move to boundary scan for SMS Electronics has been the growing number of new board designs incorporating significant

quantities of BGA and ultra-fine pitch components that prevent direct attachment of test probes. There is also little opportunity to implement test points, since board space is now premium real estate and engineers object strongly to designing additional tracks or test points on their boards as it can impair performance.

"Designers of high frequency systems, in particular, see extra copper tracks as an unwanted aerial," explains Hunt.

These challenges are felt generally throughout the manufacturing services sector. For example, when Frost and Sullivan analysed the world market for printed circuit automatic test equipment, it found that boundary scan test solutions would be an important factor driving growth from US\$970.1 million in 2004 to US\$1.55 billion by 2011. Boundary scan

testing allows a high proportion of complex, densely populated boards to be tested without requiring physical access to device pins or test probes.

But Chris Hunt and SMS Electronics are looking to boundary scan to solve additional demands facing high-mix, high-tech assemblers. Modern market demands for increased product complexity, shorter product lifecycles, frequent upgrades and expected low prices are placing extreme pressure on the traditional approaches to test and test development. At the same time, end users continue to demand high quality and reliable products.

To build the most effective response to all of these demands, SMS is using XJTAG to maximise the advantages of boundary scan testing. "XJTAG not only delivers a solution to the test access challenges that modern boards and components present, but is also supporting rapid prototyping and the completion of product development within short, modern timelines," says Hunt. "To illustrate how short these cycles are

becoming, we recently helped a customer to introduce three new variants of a product within the space of only six months."

XJTAG allows SMS Electronics to accelerate test development and reduce the time and cost involved in responding to hardware revisions, for example by implementing boundary scan to reduce the reliance on traditional and costly in-circuit test fixtures. "XJTAG allows our test engineers to respond to changes by writing test code, rather than reworking or even redesigning a test fixture, with all the costs and lead-time involved in that process," explains Hunt.

SMS Electronics has committed significant capital investment, over time, to be able to test any assembly. Using XJTAG in combination with its existing facilities allows the company to configure the strongest possible test solution for current and future boards, particularly with increasing instances of BGAs and other components where traditional access methods are no longer possible. "We have been placing BGAs and other



fine pitch devices for over a decade and have experience of using other boundary scan systems but XJTAG is rapidly becoming one of our most implemented solutions," says Hunt.

SMS Electronics works closely with customers to implement effective design for test (DFT), as this yields increased test coverage, reduced development time and lower upgrade costs. DFT is extremely effective with XJTAG, because test routines compiled at the beginning of the design process can be easily developed for prototyping and production. This enables any test changes over the lifetime of the product to become faster and more cost-effective.

"We like our customers to use the XJTAG system where appropriate as a debug and development tool and to populate their boards with JTAG components where available, as this can significantly reduce product introduction timescales and lifecycle costs," adds Hunt.

The inherent flexibility of the XJTAG solution was an important factor for SMS Electronics, which specialises in high complexity, high mix manufacturing at low to medium volumes – typically in batches of 50 to 2000 boards. "XJTAG is quick and easy to set up, the test scripts are reusable and it is highly portable due to the XJLink USB to JTAG adapter - this allows our test engineers to use the system on the shop floor, remotely or in the quieter development area," explains Hunt.

XJTAG has also been useful in recent months as SMS Electronics deals with a flurry of customers with products that have to meet the new EU RoHS regulations. "Many of our customers are finding that their products need significant redesign to meet the new guidelines and this is pushing up activity levels," says Hunt.



According to Hunt, a major driver for this heavy workload is that component manufacturers are withdrawing devices that cannot be economically converted to comply with RoHS. Where a direct, pin-for-pin replacement is not available, product designers are engaged in appreciable circuit redesign to incorporate next generation RoHS-compliant devices. "The sheer volume of this type of work, at the moment, means we have to turn essentially new products around very quickly, and this sometimes includes producing a new test solution," says Hunt.

SMS Electronics is also considering the

possible effect of lead-free joints on test probes and fixtures; specifically, whether the increased hardness of SAC solder joints will accelerate the wear-out of probes. "If data gathered over time confirms a link," adds Hunt, "then boundary scan could be a big part of the solution."

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